

THE WEATHER AND CIRCULATION OF NOVEMBER 1967

Strong Middle-Latitude Ridges, Continued Warm in the Far West and Cool in the East

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1. MEAN CIRCULATION

Most prominent among components of the 700-mb. mean circulation in November were three greatly amplified ridges at middle latitudes (figs. 1 and 2). The ridge over the Ural Mountains had positive height departures of 580 ft. and the omega configuration typical of blocking. Other maximum departures were +390 ft. in the central Atlantic and +360 ft. in the eastern Pacific west of the ridge axis. While the principal height anomaly centers were almost equally spaced, the actual ridges were not, so that the mean trough on the Pacific side of the Hemisphere was very broad between ridges almost 180° long. apart. The trough over eastern North America was less broad and quite deep while the other in the eastern Atlantic was relatively weak except in the southern portion.

It is remarkable that the extensive areas of positive height anomaly in November were almost entirely made up by height rises from October (fig. 3). The largest rises occurred in the northeastern Pacific where the October flow had been very cyclonic [1]. In response to rises, height falls occurred at lower latitudes of the eastern Pacific and the Atlantic. The resulting vigor of trough segments there led to flooding rains in southern California and Portugal during November.

The change pattern of figure 3 suggests an increase of blocking and the reduction of average wind speeds at middle latitudes that occurred over much of the Northern Hemisphere. In the western sector of the Hemisphere the zonal index declined, against the rising seasonal trend, to below normal in November for the first time since July.

2. TEMPERATURE

Departures of average temperature from normal for November (fig. 4) were most notable for their persistence. It was the fifth consecutive month that temperatures had averaged above normal in the Far West and below normal in the East. Among 100 selected cities over the United States only 13 changed by more than one temperature class (out of 5) from October to November. This was in good agreement with the small local changes of circulation in the United States but not with the amplification in Canada (fig. 3). One reason that temperatures

in Western and Central States responded slowly to the stronger northerly flow in Canada was that the amplification was not continuous, but rather frequently interrupted. Another reason was the absence of a reservoir of cold Arctic air in western Canada. Pacific Highs therefore retained mild Maritime characteristics, although their principal path across British Columbia was considerably north of normal Chart VIII [2].

Arctic air surged more frequently into the Northeast where the greatest negative departures of average 700-mb. height, height change, and temperature were found (figs. 2, 3, 4). It was the coldest November of record at Bridgeport, Conn., Worcester, Mass., and Avoca, Pa., also the coldest since 1880 at Erie, Pa. Compared with October [1], temperature anomalies were lower by 2 class categories in part of New England and 1 class near the eastern Great Lakes. It also was cooler by a class in Wyoming and western Nebraska because of unusually heavy snow cover. For a week in early November, Lander, Wyo., was the coldest first-order station in the country. The remainder of the West was generally warmer than normal beneath anticyclonic mean flow.

3. PRECIPITATION

Influenced by the deep trough just off the coast, precipitation was 2 to 10 times normal in Southern California and southwestern Arizona (fig. 5). It was the second wettest November of record at Los Angeles and Long Beach, Calif., and the wettest since 1910 at Yuma, Ariz. More than twice normal amounts fell in parts of southern Nevada and southwestern Utah. Heavy precipitation in Texas, where the flow was only slightly cyclonic, resulted from a temporary condition of over-running that is described in the following section.

Although the mean flow was cyclonic in the East the thermal pattern at the surface (fig. 4) and aloft (not shown) was not conducive to above normal precipitation everywhere in that area. Orographic effects help to account for more than normal amounts west of the central and southern Appalachians. There was a particularly marked lake effect this month in the vicinity of Lakes Michigan, Erie, and Ontario, where amounts were much greater on the downwind or eastern sides. At Erie, Pa., 3 ft. of snow was the second greatest amount

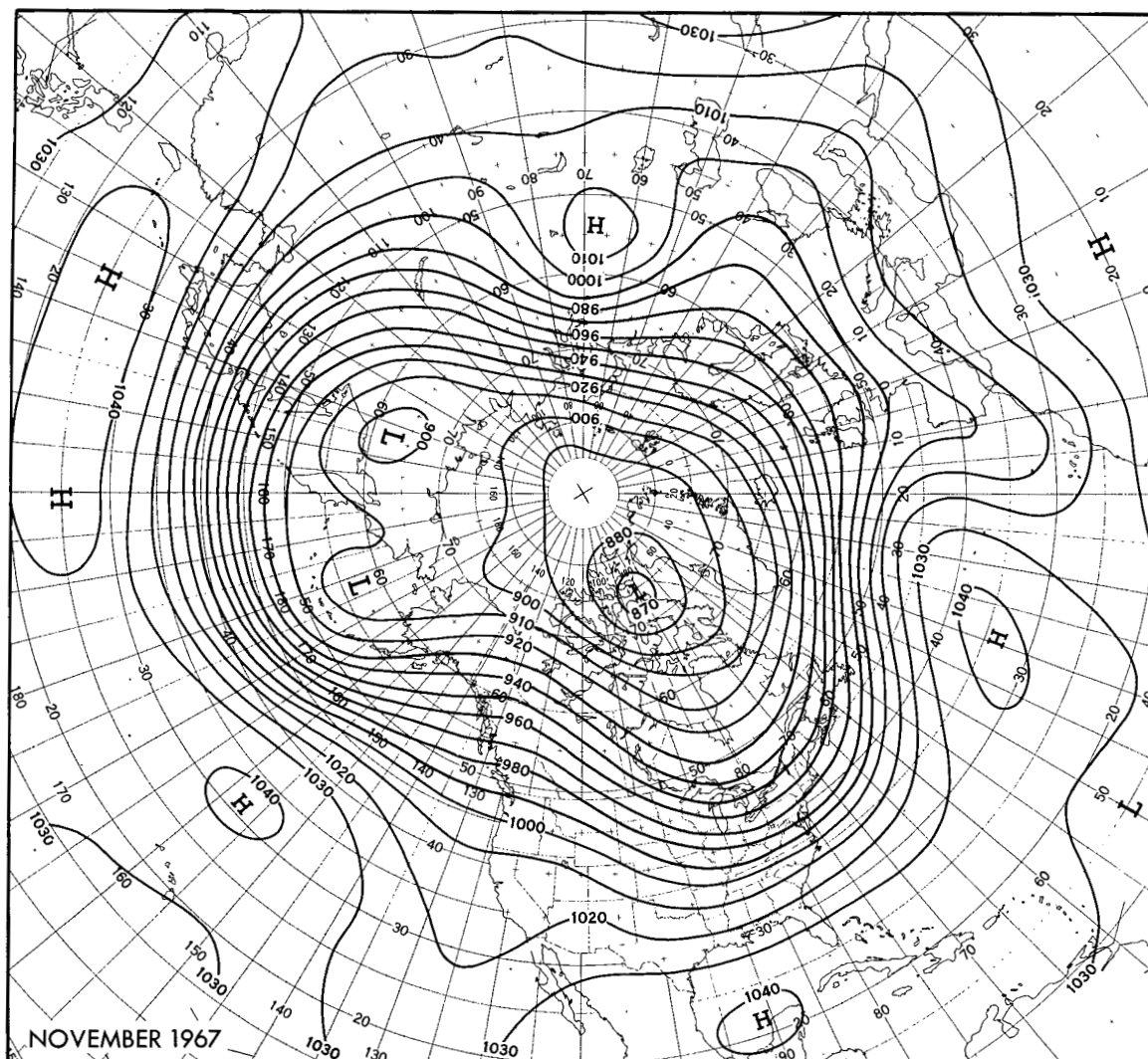


FIGURE 1.—Mean 700-mb. contours (tens of feet) for November 1967.

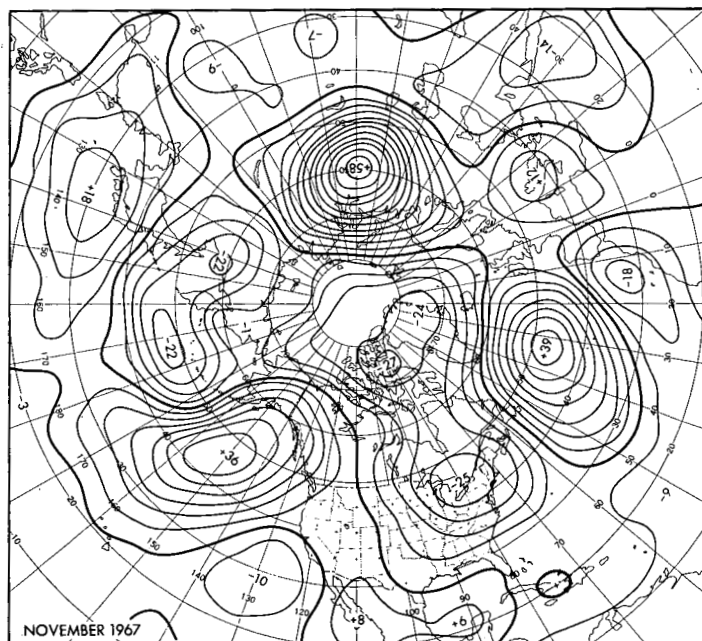


FIGURE 2.—Departure of mean 700-mb. height from normal (tens of feet) for November 1967.

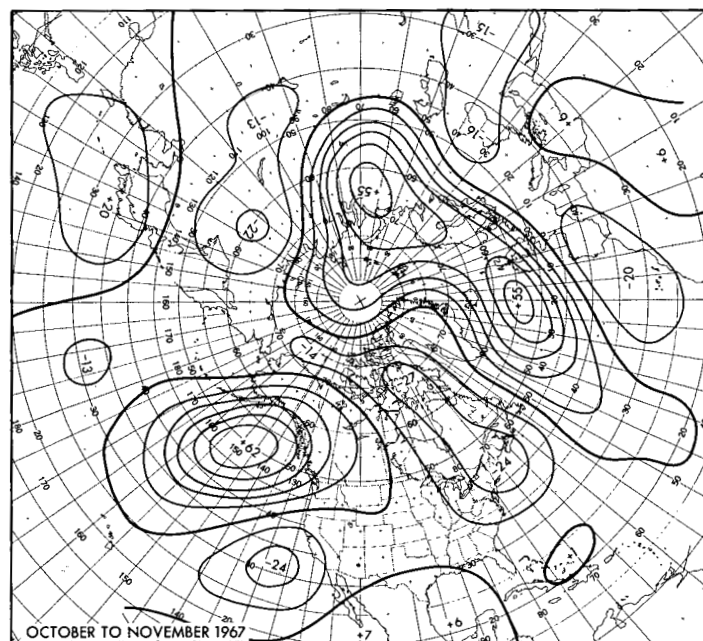


FIGURE 3.—Change of departure from normal of mean 700-mb. height (tens of feet) from October to November 1967.

of record; at Booneville, N.Y., 84 in. was the most for any month in 19 yr.

From the Pacific Northwest to the Northern Plains, where the flow was anticyclonic, precipitation was subnormal. At Pendleton, Oreg., this was the 10th consecutive dry month. It was the driest November of record at Sioux Falls, S.Dak., and the second driest at several nearby cities. In southern Louisiana a small component of offshore flow contributed to the lowest November amounts of record at Lake Charles and the second lowest at Baton Rouge. Part of Florida was also very dry. It was the driest November of record and the fifth month with deficient precipitation at Orlando, and the deficit this year was 13.58 in. at Lakeland.

4. WEATHER AND CIRCULATION BY WEEKS

OCTOBER 30–NOVEMBER 5 (FIG. 6A, B, C)

Amplification of the mean circulation at middle latitudes had already begun by early November, with a strong ridge near the west coast of North America dynamically supported by a deep Low in the Bering Sea and a strong

trough east of Hawaii. A rather deep trough extended from Hudson Bay to Texas. Temperatures were abnormally cold over most of the United States following the march of a sharp cold front southward and eastward across the Country early in the week. Over the Plains, temperatures averaged up to 13°F. below normal and were below freezing almost to the Gulf Coast. Daily minima were the lowest of record at several cities in the

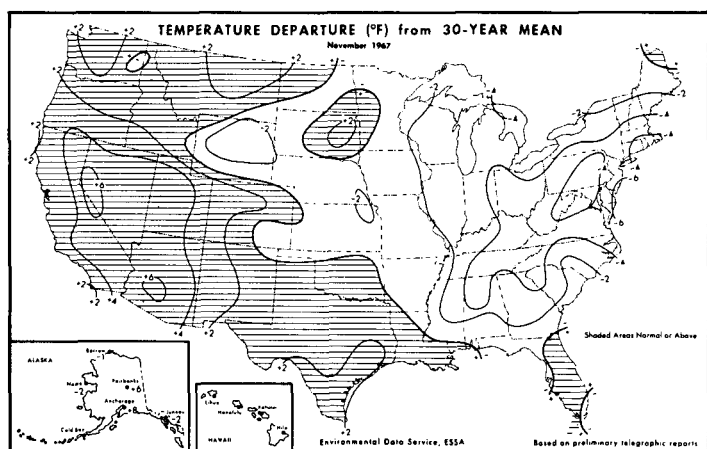


FIGURE 4.—Departure from normal of average surface temperature (°F.) for November 1967 (from [3]).

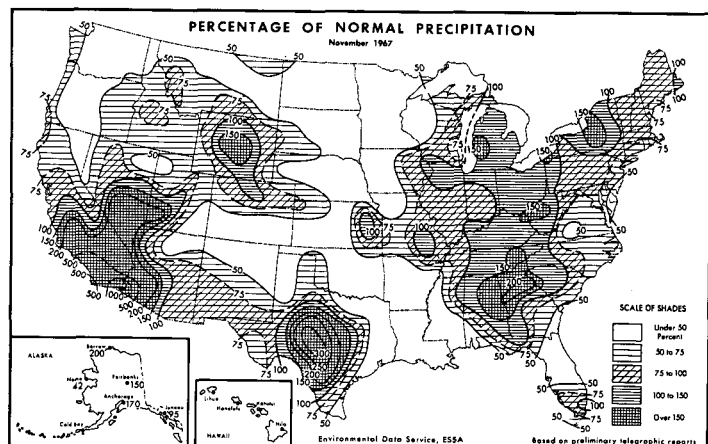


FIGURE 5.—Percentage of normal precipitation for November 1967 (from [3]).

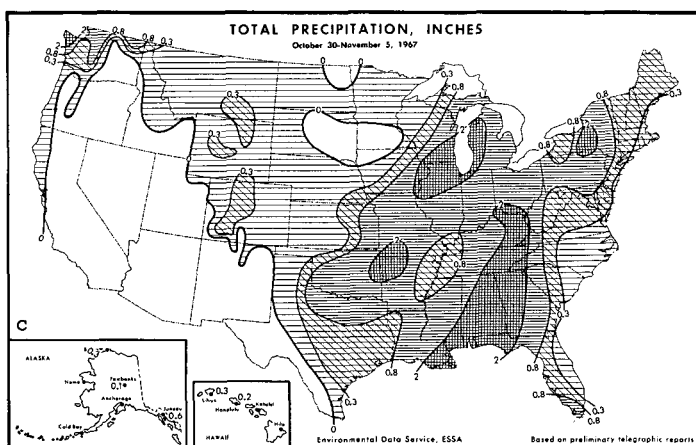
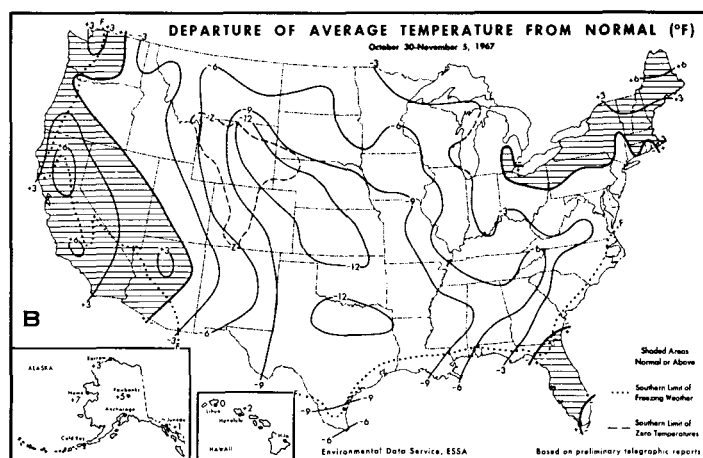
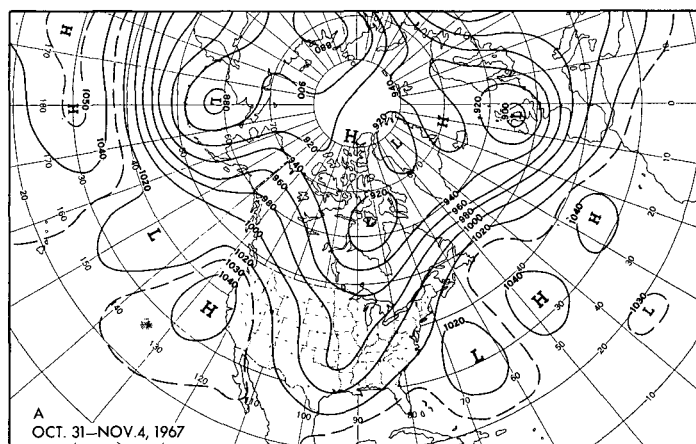


FIGURE 6.—(A) Mean 700-mb. contours (tens of feet) for October 31–November 4, 1967; (B) departure of average surface temperature from normal for week of October 30–November 5, 1967; and (C) total precipitation (in.) for week of October 30–November 5, 1967.

which then produced heavy rains along and east of its track to New England. Severe thunderstorms occurred from Alabama to South Carolina associated with this system. Tornadoes were reported at Huntsville, Ala., and Horrel Hill, S.C., and hail the size of baseballs fell at Phoenix City, Ala.

NOVEMBER 27-DECEMBER 3 (FIG. 10A, B, C)

Large weekly circulation changes continued through the end of the month. In the eastern Pacific the strong ridge retrograded and was replaced by a trough which extended

from the Gulf of Alaska to southwestern United States. East of the Rockies the broad trough was largely replaced by a ridge. In the eastern Atlantic, changes near Spain were remarkably similar to those of the previous week near California. Cyclonic vorticity from the cut-off Low moved eastward into the Mediterranean resulting in heavy rains and disastrous floods in Portugal.

Cold air covered most of the 48 States early this week followed by a slow warming trend except in the central Rockies and the Northeast where early-season snows were unusually heavy. Temperatures averaged below

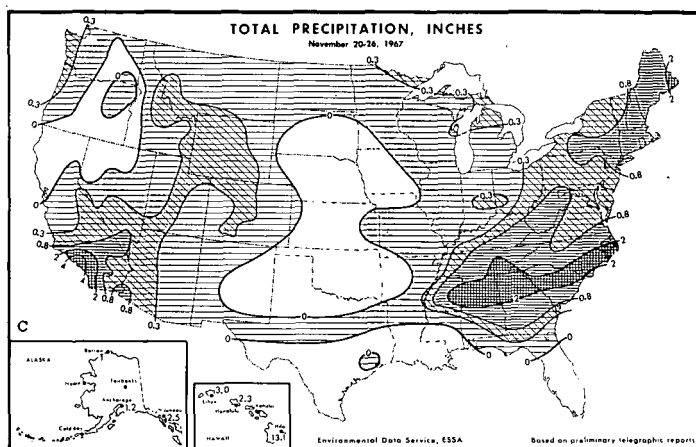
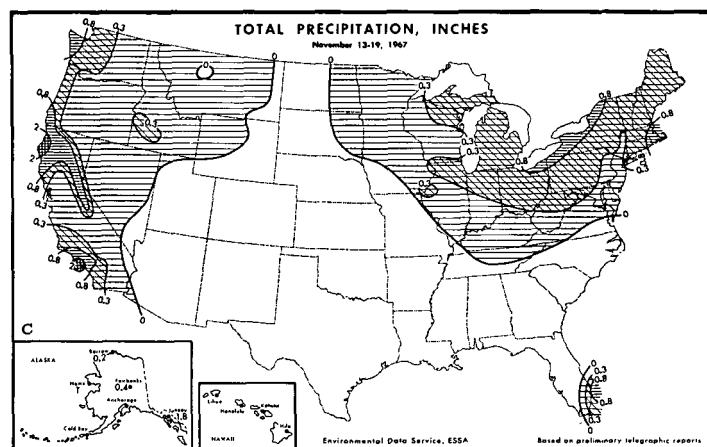
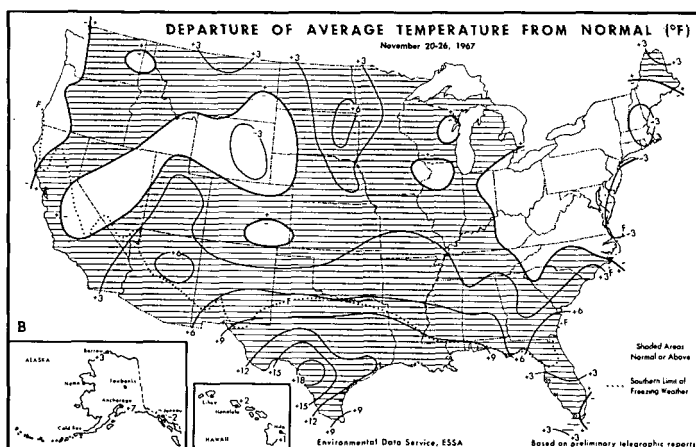
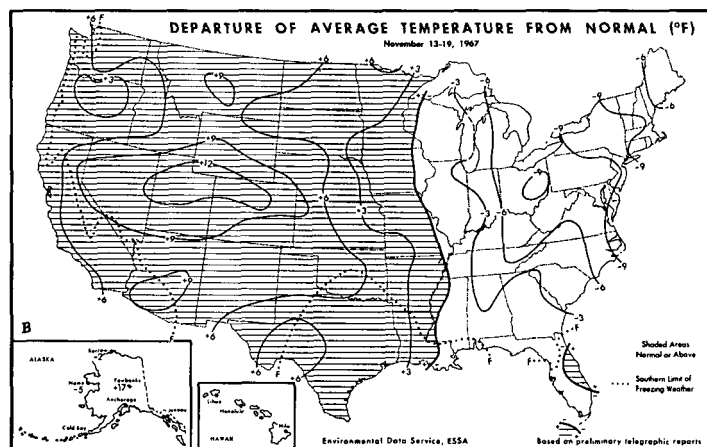
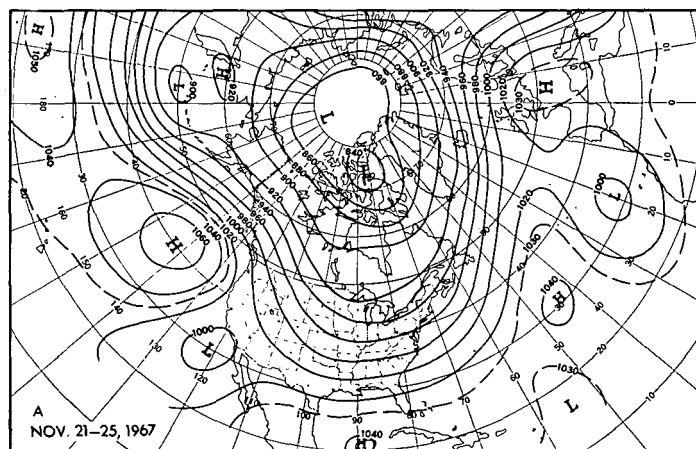
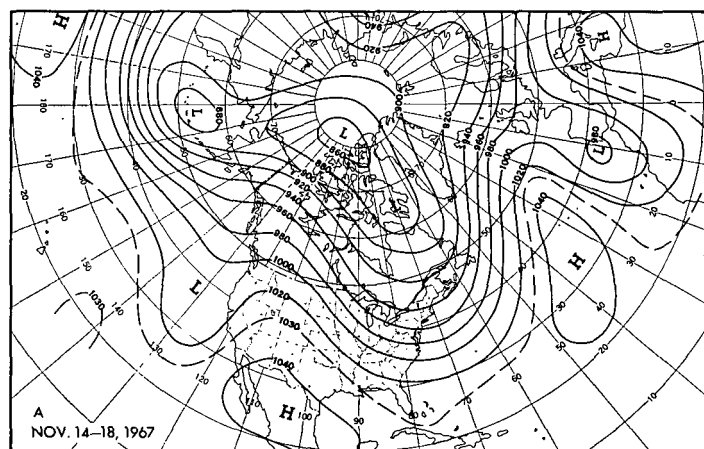
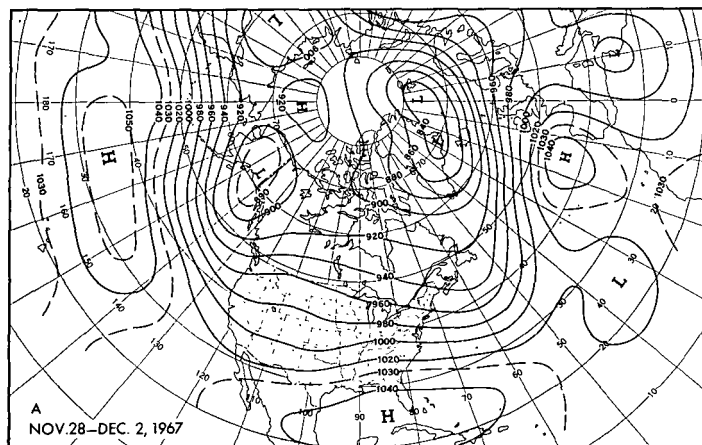


FIGURE 8.—Same as figure 6, (A) for November 14-18, 1967; (B) and (C) for November 13-19, 1967.

FIGURE 9.—Same as figure 6, (A) for November 21-25, 1967; (B) and (C) for November 20-26, 1967.



normal except in the extreme South and small areas of the Northern Plains and Pacific Northwest. Widespread precipitation was associated with a series of short waves along unusually southward paths. One storm caused rain from the Southern Plains to the Middle Atlantic States and record-breaking November snow in parts of the Northeast. The Washington, D.C., area received 7 to 12 in. and 15 to 30 in. were reported in New York State on the last day of November.

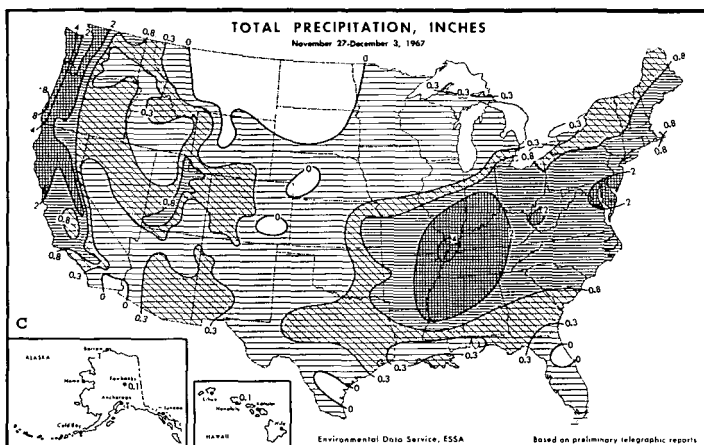
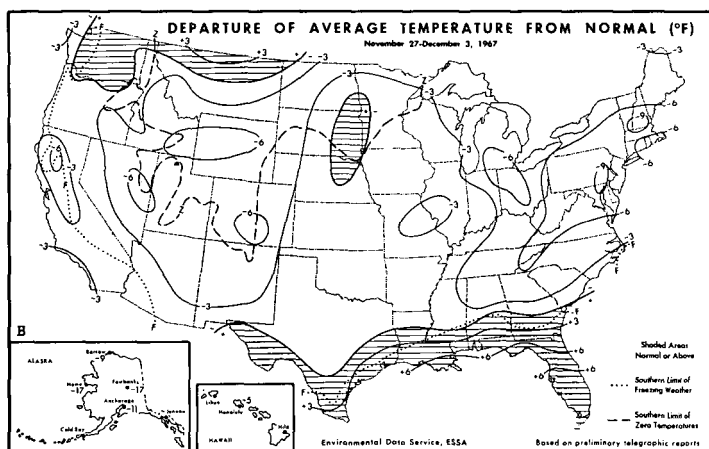


FIGURE 10.—Same as figure 6, (A) for November 28–December 2, 1967; (B) and (C) for November 27–December 3, 1967.

5. TROPICAL ACTIVITY

Noteworthy tropical storminess was confined to the western Pacific where four storms reached typhoon intensity. All but one originated south of 10°N., and none crossed the strong subtropical ridge into the westerlies. Emma became a tropical storm October 31 about 1,000 mi. east of Mindanao, became a typhoon November 4 in the South China Sea after crossing southern Luzon, and dissipated near Hainan 3 days later. Freda was first reported in the Mindanao Sea November 7 and broke up along the coast of South Viet Nam the 10th, the same day Gilda reached typhoon intensity some 1,800 mi. east of Mindanao. Gilda was destroyed over mountainous Taiwan 8 days later. Harriet began east of Guam on the 18th, curved northward, and dissipated at sea south of Japan on the 23d.

REFERENCES

1. J. F. Andrews, "The Weather and Circulation of October 1967—Continued Cool East of the Rockies and Warm in the Far West," *Monthly Weather Review*, vol. 96, No. 1, Jan. 1968, pp. 56–62.
2. Environmental Data Service, ESSA, *Climatological Data, National Summary*, vol. 18, No. 11, Nov. 1967.
3. Environmental Data Service, ESSA, *Weekly Weather and Crop Bulletin*, vol. 54, Nos. 45–50, Nov. 6, 13, 20, 27, and Dec. 4, 11, 1967, pp. 1–8.